

Program Management Review

10 Jul 2007

3QFY07



**Dr. William F. Denig, Chief
Solar & Terrestrial Physics Division**

NOAA/NESDIS/NGDC

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OUTLINE



STP Program Management Review



- **STP Overview/Status (7)**
- **Earth Observation Group (8)**
- **Earth Geophysics Group (13)**
- **Space Environment Group (15)**
- **Deep Dive – Satellite Data (6)**
- **Concluding Remarks (1)**



WHO WE ARE

STP Overview



Solar and Terrestrial Physics Division

William Denig/F Chief

Janet Brown/F, Secretary

Space Environment Group (SEG)

Eric Kihn/F, Team Lead

- Terry Bullett, AFRL
- Craig Clark/F
- Ray Conkright/C
- Ed Erwin/F
- Justin Mabie/C
- Rob Redmon/F
- Herb Sauer/C
- Dan Wilkinson/F
- Jim Manley/C
- Erin Rowland/S

Earth Observation Group (EOG)

Chris Elvidge/F, Team Lead

- Kim Baugh/C
- Ara Howard/C
- Ben Tuttle/C
- Titottama Ghosh/S
- Vacant – Data Manager/F

Earth Geophysics Group (EGG)

Vacant/F, Team Lead

- Patrick Alken/C
- Karen Horan/F
- Stefan Maus/C
- Rob Prentice/C
- Andrew Kimbrel/S
- Don Herzog/C
- Fran Coloma/C

Key

F – Federal

C – CIRES/CIRA

S – Student



Personnel Changes

STP Overview



- **Gains**

- Erin Rowland (SEG) – Student Assistant
- Titottama Ghost (EOG) – Summer Intern

- **Losses**

- Helen Coffey/F (SEG) – Federal retirement: 03Apr07
- Chris Hammond (EGG) – Resigned CIRES: 29Jun07

- **Vacancies**

- SEG/EGG non Real-time Data Manager – Tentative posting: 11Jul07
- EOG Hayes Replacement – Interviews in process; Posted: 30May07

- **Inbound**

- EGG Geomag RA (CIRES PRA) – Manoj Nair: 01Aug07
- NGS CORS/GPS Physicist – Andrea Bilich: 23Jul07
- EOG Geographer – Christof Aubrecht: 16Jul07

- **Pending**

- Solar Physicist – Approved – awaiting FY07/08 budget (CIRES PRA)
- EOG/SEG/EGG Real-time Data Manager - Awaiting approval
- NGS CORS Technician – Pending – NGS action (FY08 or later)



FY07 Milestones

STP Overview



PPBES Program	STP FY07 Milestones	Status	Planned Completion Date	Actual Completion Date	Responsible Person
AOP → Space Weather	Incorporate NGDC Virtual Radiation Belt Observatory into NASA Living With a Star (LWS) program for initial operating capability	C	(Q2) 3/31/2007	(Q2) 3/31/2007	Kihn
AOP → Space Weather	Demonstrate initial operating capability (IOC) for acquiring, processing and disseminating near real-time total electron content data to NWS/SWPC for US-TEC model	C	(Q2) 3/31/2007	(Q2) 3/31/2007	McLean
Marine Transportation Systems	Generate 1st global grid of population numbers in poverty estimated from satellite imagery	C	(Q2) 3/31/2007	(Q2) 3/31/2007	Elvidge
Space Weather	Develop database management tools with SPIDR for the NGDC geomagnetic archive	Y	(Q3) 6/30/2007		Kihn
Space Weather	Develop & release next upgrade (Version 4.0) of the Space Physics Interactive Data Resource (SPIDR)	C	(Q3) 6/30/2007	(Q3) 6/30/2007	Kihn
AOP → Space Weather	Replicate operational GOES-13 Space Environment Monitor (SEM) relational database at NGDC - <i>Deferred</i>	C	(Q4) 9/30/2007	(Q3) 6/30/2007	Wilkinson
Marine Transportation Systems	Produce an updated degree-720 crustal field model incorporating newly released marine & aeromagnetic data to improve Electronic Navigation Chart (ENC) nav models	C	(Q3) 6/30/2007	(Q2) 3/31/2007	Maus
Marine Transportation Systems	Implement near real-time visible and thermal global mosaic generation and online access system for nighttime DMSP Operational Linescan System (OLS)	C	(Q3) 6/30/2007	(Q3) 6/30/2007	Elvidge
AOP → Space Weather	Integrate Mirrion real-time ionospheric data access system with the Space Physics Interactive Data Resource (SPIDR) - <i>Deferred</i>	G	(Q1) 12/31/2007		Redmon
Marine Transportation Systems	Implement at CORS-West the collection of GNSS data for essentially all active CORS on an hourly or daily basis & in a manner that is effectively independent of CORS-East	C	(Q4) 9/30/2007	(Q3) 6/14/2007	Prentice
Marine Transportation Systems	Implement at CORS-West the OPUS utility to provide an automated GNSS data processing capability to Web clients in a manner independent of CORS-East - <i>Deferred</i>	G	(Q1) 12/31/2007		Coloma

AOP → AOP milestone

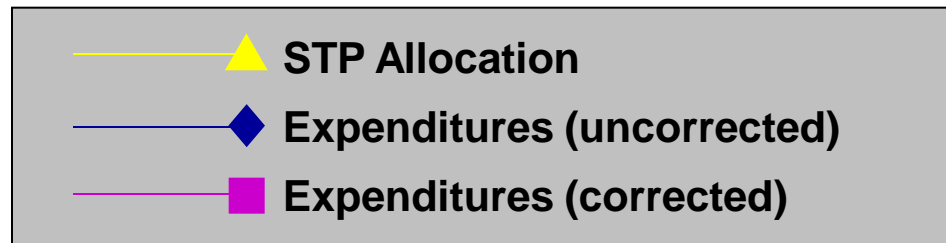
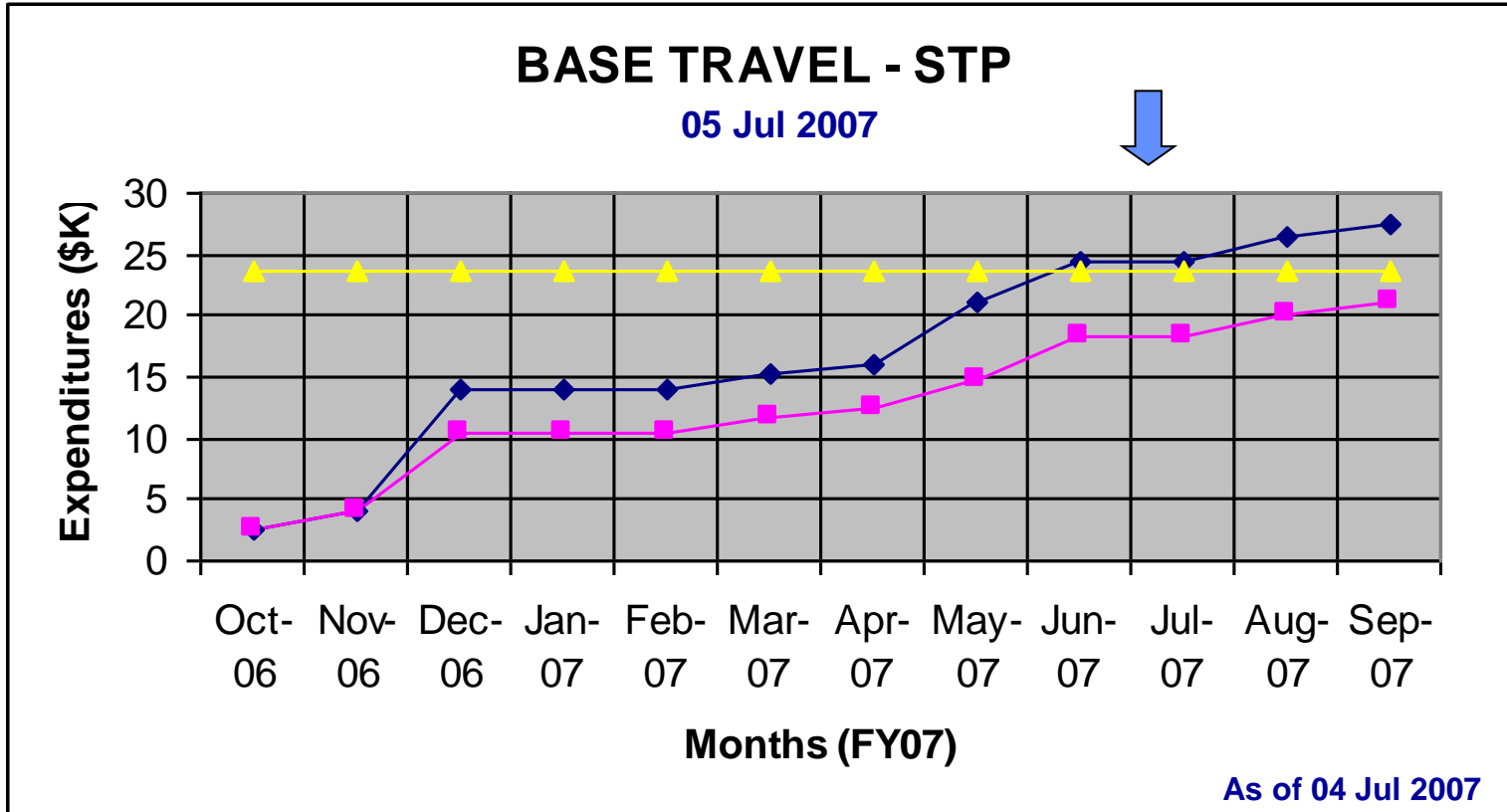
C Complete
G On-track

Y Watch Item
R Issue



Travel

STP Base Travel





MOUs / MOAs

STP Overview



STATUS

	Team	Type	Partner	NOAA Legal	DOC Legal	NGDC Signed	Partner Signed	Start	End	Status	
DMSP Archive	SEG	MOA	DMSP	X	X		X	30-May-07	30-Sep-09	G	In place - nothing to report
SWx Climatology	SEG	MOU	AFCCC	X	X	X	X	27-May-04	01-Oct-14	G	In place - nothing to report
Ionospheric Data	SEG	MOU	AFWA	X	X	X	X	21-Aug-06	21-Aug-11	G	In place - nothing to report
NASIC	EOG	MOU	NASIC	X	X	X	X	09-Mar-06	01-Jan-11	G	In place - nothing to report
CORS Support	EGG	n/a	NGS	X	X	X	X	16-Mar-07	30-Sep-07	G	In place - nothing to report
World Mag Model	EGG	MOU	NGA	X	X	X				Y	Awaiting NGA signature - info only
Ionosonde Install	SEG	SA	USAFA								Initial draft
Ionosonde Site	SEG	MOU	USGS								Initial draft
CORS Support	EGG	n/a	NGS								Initial discussions

MOA Memorandum of Agreement
MOU Memorandum of Understanding
SA Support Agreement



SEC-NGDC Summit

Action Item (AI) Status



AI-1 Determine which NWS SWx products are archived from the NOAA Weather Wire Service (NWS)

Status: Complete – recommend closure

AI-2 Determine the status of SEC datasets and products archived within NGDC

Status: Stalled – action currently on SEC to prioritize datasets

AI-3 Establish a Data Interface Working Group (DIWG) to recommend roles & responsibilities for data sharing between SEC & NGDC

Status: Ongoing – Efforts for SEC-to-NGDC data ingest are ongoing. SEC requests details regarding data access via SPIDR or other means

AI-4 Establish an Archive Interface Working Group (AIWG) to address the resource accommodations for current and future (new) SEC data products within NGDC

Status: Ongoing – Several SAs are in-process for acquiring SEC SWx data & products



SEC-NGDC Milestones

Recommendations for FY08



Background: Tom Bogdan has requested a “summit” between the organizations to assess progress to date and to establish several milestones for next year. Kelly Pendergast is Tom’s action officer (AO) for this action.

Recommendation: Rather than assemble the full organizations for the annual summit it is my recommendation that senior representatives from SEC and NGDC meet to discuss progress and agree to several milestones for FY08.

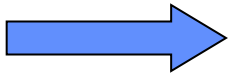


OUTLINE



STP Program Management Review

- **STP Overview/Status**



- **Earth Observation Group**

- **Earth Geophysics Group**

- **Space Environment Group**

- **Deep Dive – Satellite Data**

- **Concluding Remarks**



Earth Observation Group Overview



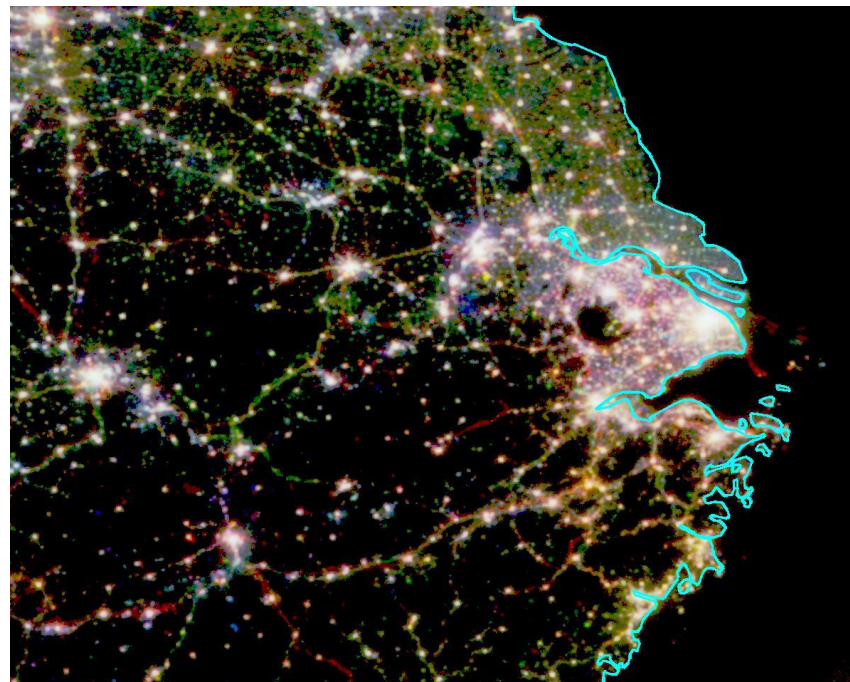
The mission of the EOG is to provide archive data management (ingest, archive and access) for NOAA and other earth observation remote sensing data, development and production of higher-level products, development of data delivery / customer base, and participation with scientific communities

Group Leader: Dr. Chris Elvidge

- Archive grows 20.5 GB/day¹
- Archive now at ~60 TB²
- Annual composites are distilled from about 1 TB of geolocated OLS data

¹33% increase from 4QFY06

²Up from 56 TB @ 4QFY06 - Does not include DMSP “raw” data backup



DMSP-OLS Average visible band DN color composite of Shanghai (2003, 1998, 1992 as red, green, blue)



STP/EOG Task

DMSP Archive, Products & Services



NightTime Lights of the World



Background – DMSP OLS (visible and infrared) imagery from 1973 to present is used to observe lights from cities, fires, gas flares and fishing boats.

Purpose – DMSP NightTime lights are used to map changes in economic activity, population numbers and constructed area. The products are widely recognized as a key satellite observation of humanities presence on the land and ocean surface.

Upcoming Milestones

2QFY07 – Generate 1st global grid of population numbers in poverty from satellite imagery [**Done**]

3QFY07 – Implement near real-time visible and thermal global mosaic generation and online access system for nighttime DMSP Operational Linescan System [**Done**]

Team Members: Chris Elvidge, Kim Baugh, Ara Howard, Ben Tuttle, Titottama Ghost

Status: Re-processing of the DMSP nighttime lights imagery is presently stalled. The EOG is critically understaffed.

www.ngdc.noaa.gov/dmsp/global_composites_v2.html



STP/SEG Milestone

Near Real-Time Global Mosaics



Milestone – Implement near real-time visible and thermal global mosaic generation and online access system for nighttime DMSP Operational Linescan System (OLS)

Background – Selected users of the DMSP nighttime lights product have requested that the NGDC develop a real-time capability for visible and thermal global mosaics and that these data be made available online. The systems have been prototyped and are now being tested and refined.

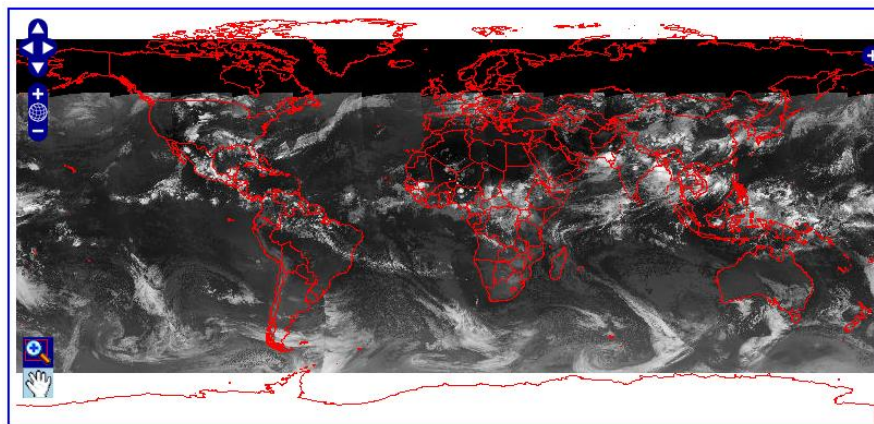
Completion Date:

Planned: (Q3) 6/30/2007

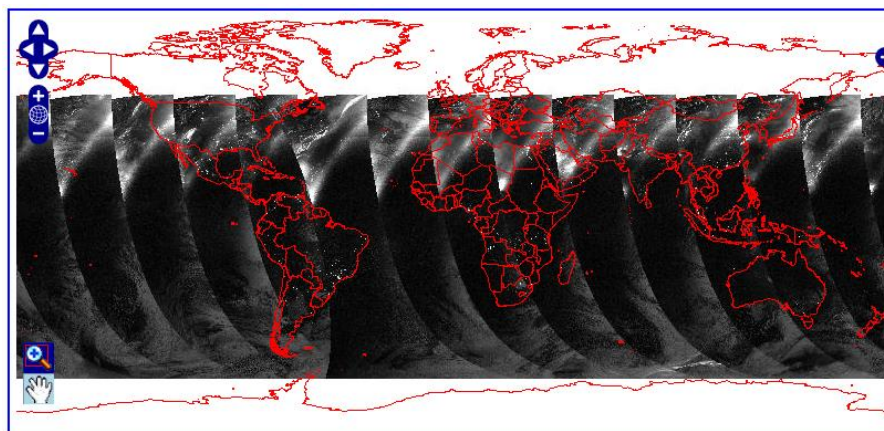
Actual: (Q3) 6/30/2007

Significance – Real-time imagery using the DMSP Nighttime Lights capability are used for natural disaster mitigation, homeland security applications and military operations,

Cognizant Person: Dr. Chris Elvidge



July 3, 2007 Satellite F16 Thermal Band Mosaic



July 3, 2007 Satellite F15 Visible Band Mosaic



Special Interest Item

National Constructed ISA

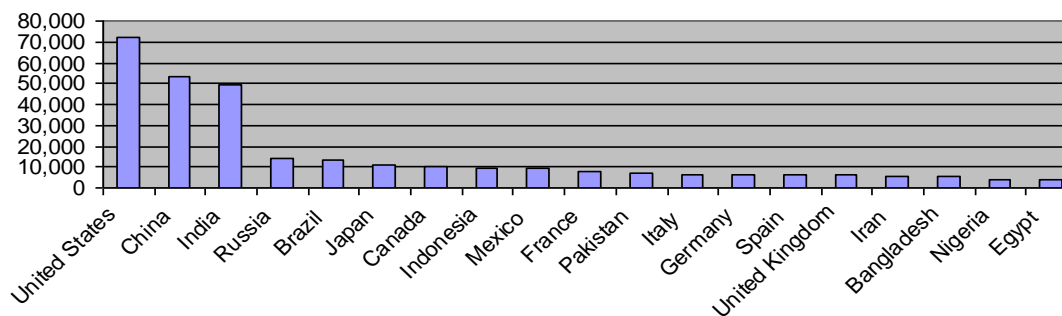


Top 20 Countries of Highest Constructed Impervious Surface Area (ISA) Densities [2000-2001]

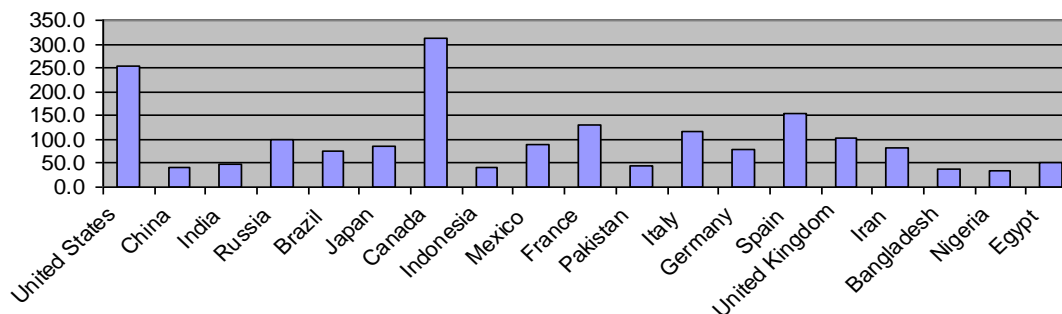
National ISA Metrics

Country	Total area	Per capita
United States	72,111	255.2
China	52,969	41.0
India	49,217	46.5
Russia	13,913	100.1
Brazil	13,308	74.8
Japan	10,693	87.5
Canada	10,028	313.2
Indonesia	9,721	42.3
Mexico	9,274	89.2
France	7,838	131.7
Pakistan	6,945	46.1
Italy	6,600	116.7
Germany	6,408	77.8
Spain	6,062	153.5
United Kingdom	6,058	102.8
Iran	5,490	82.4
Bangladesh	5,129	36.6
Nigeria	4,121	32.9
Egypt	3,998	53.1

Total ISA by Country (Square km)



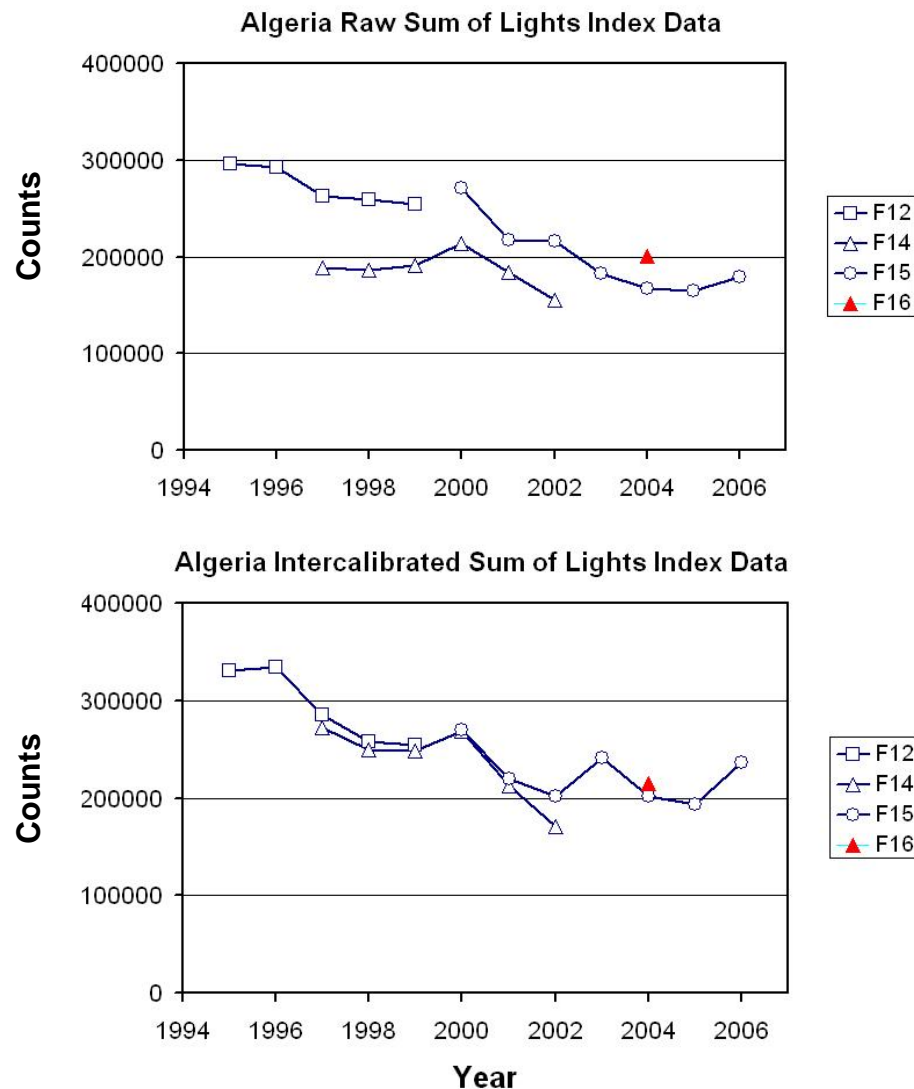
Per Capita ISA (Square km)





Special Interest Item

DMSP OLS Inter-calibration



The EOG group has developed a procedure for the empirical inter-calibration of the annual nighttime lights product based on a reference area having stable lighting. The product from satellite F12 1999 was found to have the highest digital number values. Gains and offsets were derived using a second order regression to translate each year of data to match the values in F12 1999.



Accomplishments

Earth Observation Group



- **Papers – 2 Proceedings / 2 in Print / 2 Submitted**
- **Near real-time global OLS nighttime visible and thermal band mosaics generation now operational**
- **Prototype web mapping services (wms) and web coverage services (wcs) established using open source code for 2000-2003 global nighttime lights composites, recent lunar cycle composites, and nightly global mosaics**
- **Google Earth links established for 2003 nighttime lights, gas flares (1992, 2000, 2006 as rgb) and high resolution nighttime lights of Las Vegas, Nevada**



Publications, Conferences and Media

Earth Observation Group



- Presentations made at 9 conferences / symposia
- 2 proceeding publications
- 1 peer review paper remains in press, 1 accepted, 2 submitted
- • Boston Globe article on gas flaring 21 June 2007
- • BBC Earth Report #12 “Billion Dollar Bonfire” May 200





Issues & Concerns

Earth Observation Group



- **CIRES new hires required to backfill Hayes and Howard (part time)**
- **EOG would like to migrate the archive DMSP OLS to CLASS (per L1L requirements)**
- **New products and services need to get covered by unit cost certifications**
- **Filling the Federal near real time data manager position (backfill for Kineman) would be a boon!**



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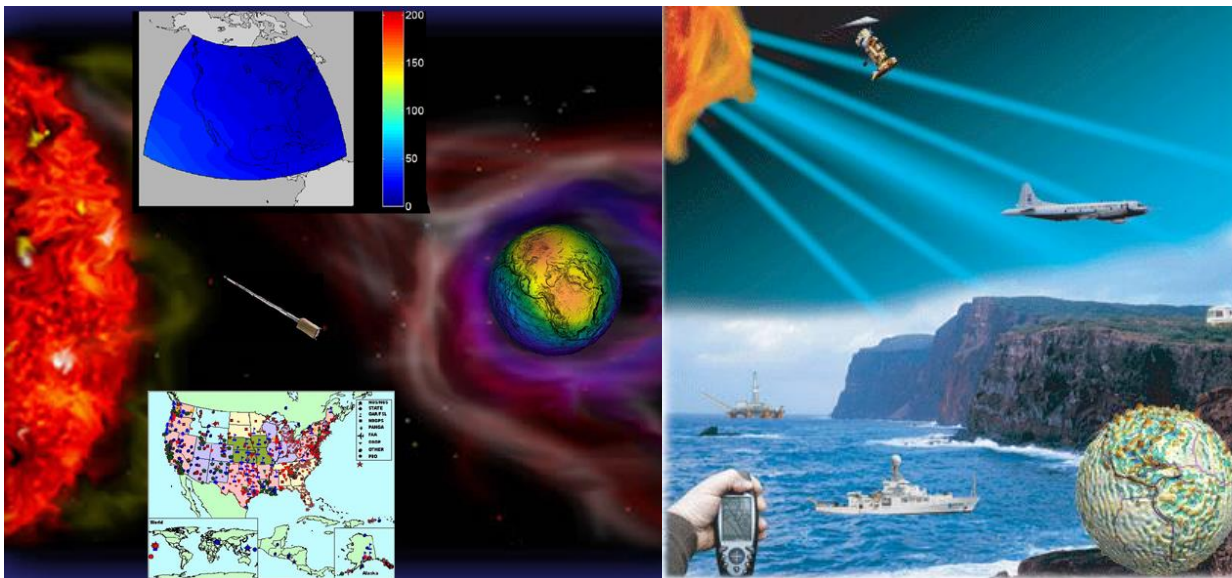


Earth Geophysics Group Overview



The focus of the EGG is to provide scientific stewardship, products, & services for data from Earth's physical environment supporting safe navigation including magnetic field modeling and CORS-West. The EGG also supports international data collection, exchange and visiting scientists through the WDC for Solid-Earth Geophysics.

Team Lead: Vacant



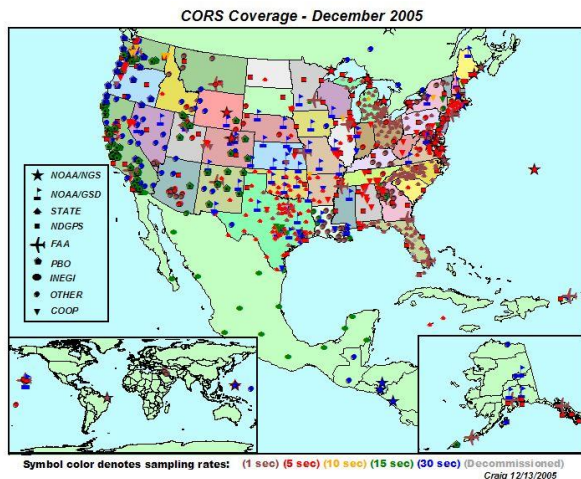


STP/EGG Task

Continuously Operating Reference Station



CORS Coverage



Background – NOAA / NGS coordinates a network of continuous GPS receivers for 3-dimensional positioning activities throughout the US and its territories.

Purpose – NGDC operates the CORS-West parallel site as requested by NGS (in Silver Spring, MD). NGDC supplies CORS data in near real-time to NOAA SEC and GSD for use in ionospheric and weather specification and forecast models.

Upcoming Milestones

2QFY07 – Support operational, real-time USTEC product. **[Done]**

4QFY07 – Implement CORS-West data collection scripts for independent ingest of GNSS data **[Done]**

4QFY07 – Implement OPUS utility at CORS-West **[Watch item]**

Team Members: Fran Coloma, Bill Denig, Ernie Joynt, Rob Prentice, Karen Horan

Status: Directors for NGDC & NGS meet to discuss current and future interactions. NGS new hire (Andria Bilich) start date is 23Jul07. CORS-West provides continuous service during CORS-East scheduled downtime. Initial planning for NOAA-wide GNSS users' meeting in Boulder.

Marine Transportation System program



STP/EGG Milestone

CORS-West Collector Scripts



Milestone – Implement at CORS-West the collection of GNSS data for essentially all active CORS on an hourly or daily basis and in a manner that is effectively independent of the operational status of CORS-East

Background – Collection of CORS data at both locations is via per-station and per-group scripts. This was fine when the number of GNSS receiver sites was below 100. The number of GNSS sites now exceeds 1000 and the overhead associated with the current methodology is very inefficient. The intent is to design, build and implement a communications infrastructure at CORS-West that consolidates many scripts into a single utility that is database driven, efficient, robust and well documented. This completed milestone represents the first step in the development of an Internet Collector which provides automated oversight of the data collection, station updates, and processor load balancing for more efficient operations.

Completion Date - Planned: (Q4) 9/30/2007

Current: (Q3) 6/14/2007 **[Done]**

Status – **Complete** – New collector scripts at CORS-West have been implemented for independent ingest. During the period 20-26 May, the CORS-West operated independent of CORS-East while NGS was undergoing some planned upgrades to its IT security infrastructure.

Cognizant Person: Rob Prentice

Program: Marine Transportation Systems



STP/EGG Milestone

OPUS at CORS-West



Milestone – Implement at CORS-West the On-line Positioning User Service (OPUS) utility to provide an automated GNSS data processing capability to Web clients in a manner that is effectively independent of the operational status of CORS-East.

Background – OPUS is an NGS utility to allows users to submit their GPS data files for corrected and accurate geolocation. Each data file submitted by the user is processed using three (3) CORS reference sites optimized by distance, # of obs, site stability, etc. The positional data is then returned to the user via email. OPUS is currently operational at CORS-East. The intent is to make OPUS operational at CORS-West. Operational implementation of OPUS requires both the OPUS software and hardware implementation.

Completion Date - Planned: (Q4) 9/30/2007

Current: (Q1) 12/31/2007

Status – **Deferred** – Per NGS (R. Snay). Efforts in this area were delayed due to NGS manpower diversions to handle IT security issues and NGS' acquisition of hardware. NGS/NGDC are currently in discussion regarding the optimum system configuration to implement OPUS at CORS-West.

Cognizant Person: Francine Coloma

Program: Marine Transportation Systems



Info for the Director

NGDC Exercises COOP for NGS CORS



Background – NGDC recently executed a Continuity Of Operations Plan (COOP) for the National Geodetic Survey (NGS) Continuously Operating Reference Stations (CORS). The planned transfer of control from the NGS CORS-East site in Silver Spring to the Boulder CORS-West facility occurred on 20 May and lasted for about a week. This transfer was required to facilitate computer security upgrades in the NGS network. While NGS-West was in control certain known capabilities, such as the Online Positioning User Service (OPUS), were not available to users although otherwise the CORS system remained fully functional. Efforts are continuing to make a fully parallel CORS-West site within NGDC (mostly) independent of CORS-East. *Special thanks are due to Ernie Joynt (NGDC), Donna Sailer (NGS), Bruce Sailer (NGS) and others at Silver Spring for a successful transfer of CORS control.*

Federal Emergency Management Agency
Directives Management System

U.S. Department of Homeland Security
Washington, D.C. 20472



FEMA

FEDERAL PREPAREDNESS CIRCULAR

FPC 65 **Date** **Office**
June 15, 2004 **Office of National Security Coordination**

TO: HEADS OF FEDERAL DEPARTMENTS AND AGENCIES

SUBJECT: FEDERAL EXECUTIVE BRANCH CONTINUITY OF OPERATIONS (COOP)

1. **PURPOSE:** This Federal Preparedness Circular (FPC) provides guidance to Federal Executive Branch departments and agencies for use in developing contingency plans and programs for continuity of operations (COOP). COOP planning facilitates the performance of department/agency essential functions during any emergency or situation that may disrupt normal operations.
2. **APPLICABILITY AND SCOPE:** The provisions of this FPC are applicable to all Federal Executive Branch departments, agencies, and independent organizations, hereinafter referred





Info for the Director

NGS Visit to Boulder



David Zilkoski



Chris Fox



Seth Gutman



Tom Bogdan

Background - The NGS Director, Dave Zilkoski, and other representatives from NOAA Oceans NGS visited staff from NOAA Line Offices Weather, Research, and Satellites in Boulder to discuss areas of mutual interest. Other senior NOAA representatives at these meetings included Chris Fox (NESDIS/NGDC Director), Tom Bogdan (NWS/SEC, Director) and Seth Gutman (Lead scientist, GPS-Met program, OAR/ESRL). Key discussions with the group involved the utilization of and more stringent requirements for the NGS Continuously Operating Reference Stations (CORS) data. NGDC maintains a parallel CORS facility for the NGS. Other discussions with NGDC involved co-locating NGS employees with NGDC to enhance the current CORS program, improve collaborations with NOAA research, and potentially support to the NOAA Tsunami program with geodetic and LIDAR expertise.



Info for the Director

NOAA-Wide GPS Workshop



Message to AA & Goal Team Leads – The Directors of the NOS/National Geodetic Survey, NESDIS/National Geophysical Data Center, NWS/Space Environment Center, and the OAR/Earth System Research Laboratory would like to organize a 2-day, cross-NOAA meeting focused on how our organization uses the Global Positioning System (GPS) or, more generally, the Global Navigation Satellite System (GNSS) in research and operations. Presentations from across all the Line Offices will be solicited. The thrust of this meeting will be mostly technical but at a fairly general level given the expected diversity in audience participation. The results of the meeting will be summarized in an informational report to NOAA senior management, Regional Teams, Goal Team Leads, and Program Managers. At this time, the Directors ask that each Line Office/Staff Office identify a POC willing to assist the organizing committee in setting up this meeting. The target date for the meeting is in September 2007 at the Boulder NOAA facility. The organizing committee thus far consists of:

- Nancy Doyle, NOS/NGS,
- Bill Denig, NESDIS/NGDC
- Tom Bogdan, NWS/SEC
- Seth Gutman, OAR/ERSL
- Jason Kim, NESDIS
- Jim Yoe, NESDIS



Note: This workshop is tentatively scheduled for the week of 10-14 Sept in the DSRC Room GC402.

STP PMR – 10 Jul 2007





Special Interest Item

Fran Coloma Participates in CSAV Program



Background – The Center for the Study of Active Volcanoes (CSAV) is located on the Big Island of Hawai'i, and operates out of the University of Hawai'i at Hilo. The Center is a training and outreach program established by the Hawai'i State Legislature in 1989, and was founded by Robert W. Decker. CSAV's mission is to provide training and information on volcanic and natural hazards that occur in Hawai'i and worldwide.

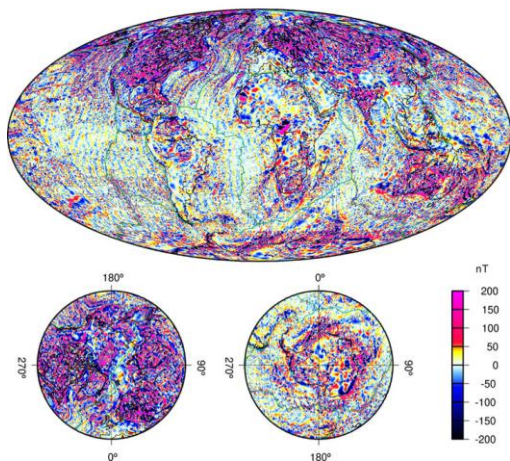


Francine Coloma provided expert advice and training to participants in the International Training Program at the CSAV Hilo Center in Hawaii on the week of 11-15 June 2007. The 5 participants in this year's program included participants from El Salvador, Papua New Guinea, Italy, and the Philippines. During this 1-week program Ms Coloma provided hands-on training in the use of common tools, such as GPS, to monitor volcanic activity. Fran's participation in this training event provides both humanitarian and environmental benefits.

STP/EGG Task

Geomagnetic Data & Services

Crustal Magnetic Field



Background – The WMM is the standard magnetic model used by US military/civilian agencies and allied nations. The WMM is a product of the United States National Geospatial-Intelligence Agency. NGDC and the British Geological Survey jointly produce the WMM.

Purpose – The WMM satisfies requirements supporting navigation and attitude/heading referencing systems.

Upcoming Milestones

3QFY2007 – Produce an updated degree-720 crustal field model incorporating newly released marine & aeromagnetic data to improve ENC navigation models **[Done]**

3QFY20007 – Develop database management tools with SPIDR for the NGDC geomagnetic archive {see SEG quad for SPIDR}

Team Members: Stefan Maus, Bill Denig, Tanya Sazanova, Don Herzog, Patrick Alken, Andrew Kimbrel, Sue McLean.

Status: Don Herzog has now updated the geomag data holdings to include definitive data from the Intermagnet program. Station level metadata tools under development. Stefan, Pat, & Sue at IUGG.

Marine Transportation System program



Info for the Director Intermagnet



Background – The INTERMAGNET program exists to establish a global network of cooperating digital magnetic observatories, adopting modern standard specifications for measuring and recording equipment, in order to facilitate data exchanges and the production of geomagnetic products in close to real time. Through arrangement with the program office, NGDC archives & distributes historical Intermagnet data through SPIDR and other web accessible means. The Boulder USGS magnet site at Table Mountain is a member observatory in Intermagnet.



Significance – Intermagnet definitized data is the highest quality data available and allows NGDC to better serve its users. Don Herzog has coordinated with the Intermagnet program office to allow NGDC to serve these data. Don has also been working to improve user access to the NGDC magnetic field holdings.



Info for the Director

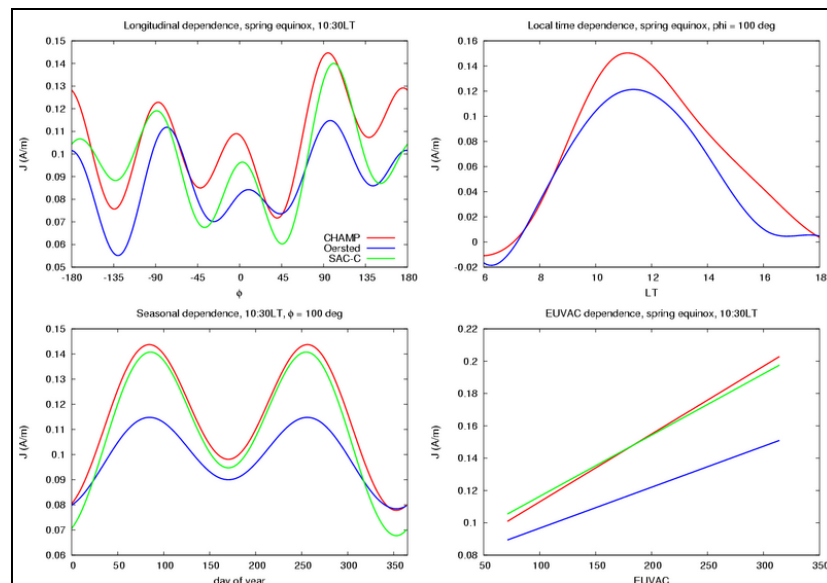
Pat Alken's Paper Accepted in JGR



Title: Spatio-temporal characterization of the equatorial electrojet from CHAMP, Ørsted, and SAC-C

Authors: Patrick Alken & Stefan Maus

Abstract. The equatorial electrojet (EEJ) is an eastward electric current on the day-side, flowing in a narrow band along the dip equator in the ionospheric E-region. Recent magnetic observations from the CHAMP, Ørsted, and SAC-C satellites, comprising more than 95,000 dip equator crossings from 1999 to 2006, have provided an unprecedented longitudinal coverage of the EEJ magnetic signature. We have used these data to construct an empirical model of the EEJ current's climatological mean and day to day variability as a function of longitude, local time, season, and solar flux. Our model has been successfully verified against vertical drift data from the JULIA radar at Jicamarca. We have also used the EEJ observations to estimate the selfcorrelation of the EEJ, confirming short longitudinal correlation lengths of 15° and finding a temporal correlation length of 2.4 hours. Our model's predictions of the eastward electric field and its standard deviation may provide useful input to various kinds of ionospheric simulations. Coefficients and software are available online at <http://models.geomag.us/EEJ.html> and <http://www.earthref.org.satellite> magnetic measurements





Accomplishments

Earth Geophysics Group



- **Papers – 3 Published / 4 in Print / 3 submitted (FY07)**
- **S. Maus / P. Alken / S. McLean currently at IUGG**
- **Successful discussions with Kent Tobiska on standards for environmental models**
 - ✓ Resolved issues related to identifying standard magnetic model
 - ✓ Spurred efforts to include IGRF as an ISO standard
- **Pat Alken's paper on equatorial electrojet accepted**
 - ✓ Manuscript now "in print" in Journal of Geophysical Research
- **Senior Management Visit by NGS to NGDC**
 - ✓ Discussed increasing # of NGS employees at NGDC to ~5
 - ✓ Initiated plans for NOAA-wide GNSS meeting in Boulder



Issues & Concerns

Earth Geophysics Group



- **Outstanding / Pending Vacancies**
 - ✓ Real-Time Data Manager (Fed) to be posted 11Jul07
 - ✓ Don Herzog reducing time to 60% effort
- **Issues related to Geomag data in SPIDR not fully resolved**
 - ✓ Slow implementation of improved access tools
 - ✓ Need to clearly identify degree pedigree
- **Supporting Real-time Operational USTEC**
 - ✓ Single points of failure in acquisition & transfer of GNSS data



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- Concluding Remarks

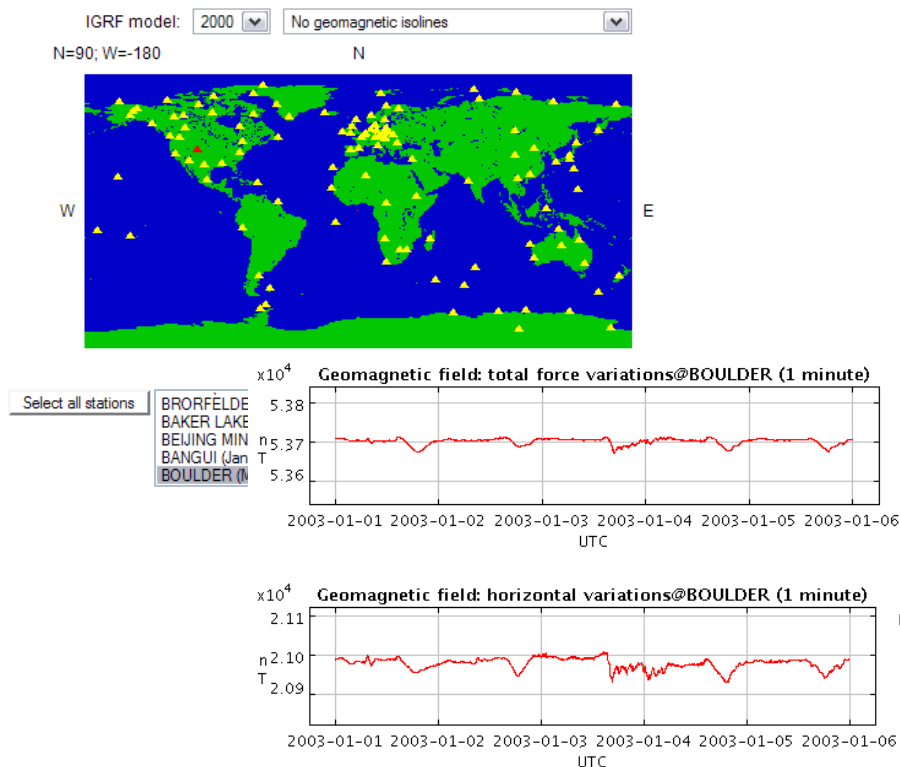
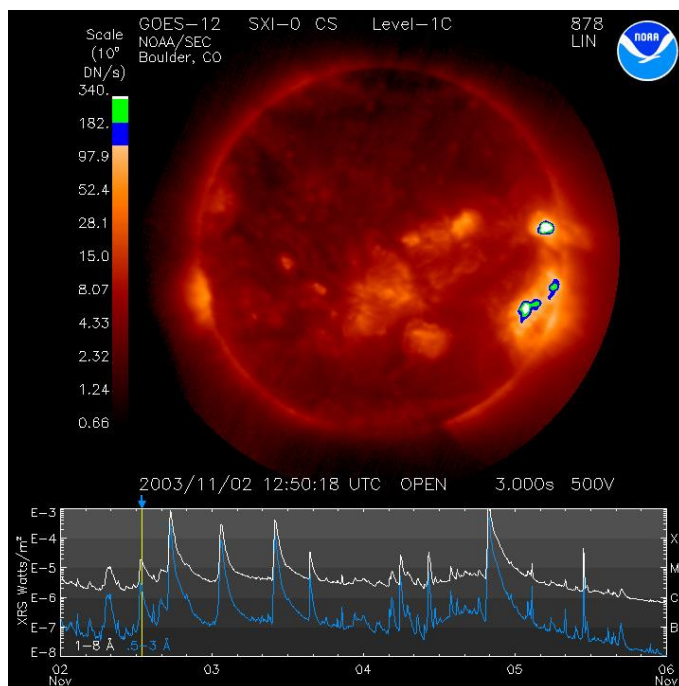


Space Environment Group Overview



The Space Environment Group is focused on the archive and management of NOAA's space environmental data. The SEG also supports international data exchange and collection through World Data Center activities.

Group Leader: Dr. Eric Kihn





Special Interest Item

Solar Maximum Predictions

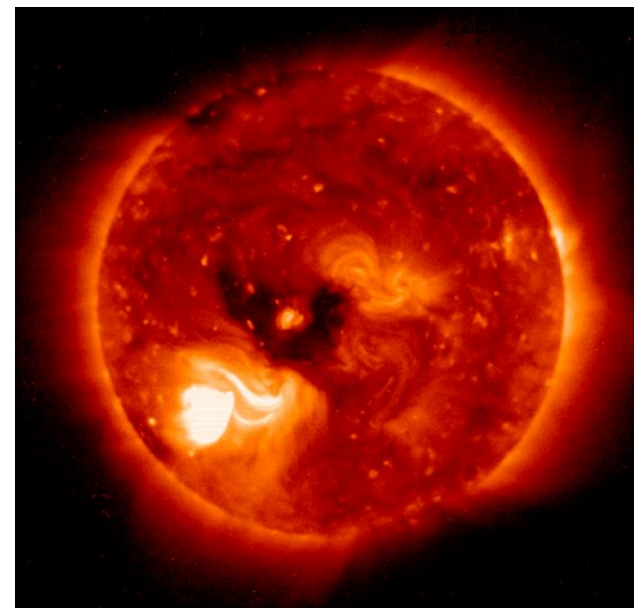


NEWS FROM NOAA

NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION • US DEPARTMENT OF COMMERCE

NOAA Press Release: 25 April 2007

The next 11-year cycle of solar storms will most likely start next March and peak in late 2011 or mid-2012 – up to a year later than expected – according to a forecast issued today by NOAA's Space Environment Center in coordination with an international panel of solar experts.



Background: Dr Eric Kihn from NGDC participated in the solar predictions panel for cycle 24. Over the past year the predictions panel reviewed the scientific evidence and reached consensus only after considerable and vigorous debate. The panel activities were funded in part by NASA.

Significance: Variations in solar activity over the 11-year solar cycle have direct geo-consequences. The increased number and intensity of solar events around solar max are disruptive to GPS navigation, airline operations, electric power grids and satellite tracking. Equipment managers and flight planners consider solar activity in their daily operations.

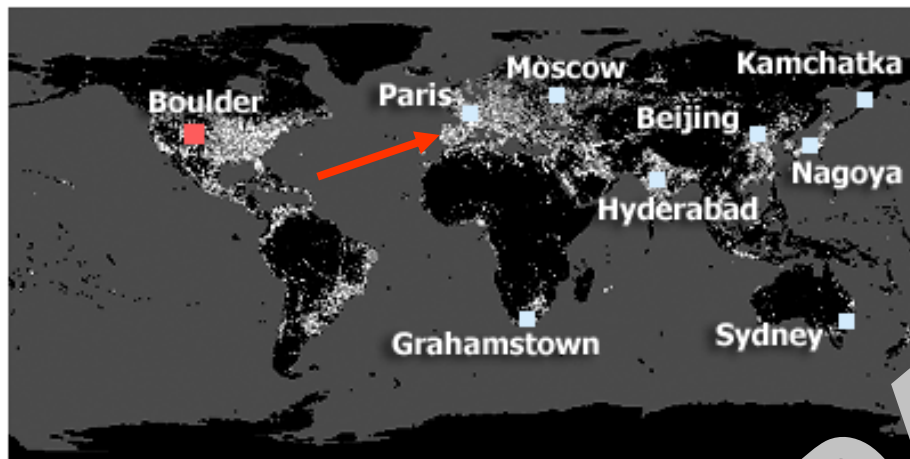


STP/SEG Task



Space Physics Interactive Data Resource

Global SPIDR mirror sites



SPIDR nodes as of January 2007.

Milestones

➡ **2QFY07** – Incorporate ViRBO into NASA LWS program for IOC **[Done]**

3QFY07 – Develop database management tools with SPIDR for the geomagnetic archive **[Watch Item]**

3QFY07 – Develop & release SPIDR 4.0

➡ Milestone in the AOP

STP PMR – 10 Jul 2007

Background – SPIDR is a distributed network of synchronous databases and 100% Java middle-ware servers accessed via the World Wide Web. SPIDR 4.0 is in test phase.

Purpose – SPIDR allows a solar terrestrial physicist to intelligently access and manage historical space data for integration with environmental models and space weather forecasts.

Team Member: Eric Kihn, Rob Redmon, Mikhail Zhizhin, Don Herzog

Status – A new SPIDR node has been installed at the Center for the Study of Terrestrial and Planetary Environments (CETP), Pierre Simon Laplace Institute in Paris (<http://spidr.cetp.ipsl.fr/spidr>). SPIDR is currently undergoing extensive redesign for release 4.0.

Space Weather program



STP/SEG Milestone (AOP)

Incorporate ViRBO into NASA LWS



Milestone – Incorporate NGDC Virtual Radiation Belt Observatory (ViRBO) into NASA Living With a Star (LWS) program for initial operating capability.

Background – NGDC is developing the Virtual Radiation Belt Observatory (VIRBO) in support of the NASA LWS program. The principal objectives of VIRBO are to enable scientific discovery and support satellite hazard mitigation by providing a gateway for scientists, operators and engineers to high-quality, calibrated radiation belt data and model output in a unified form along with analysis tools. VIRBO will be the key access tool for LWS Radiation Belt Storm Probes (launch in 2012). The foundation of VIRBO is the NOAA Space Physics Interactive Data Resource (SPIDR).

Completion Date - Planned: (Q2) 3/31/2007

Current: (Q2) 3/31/2007 **[Done]**

Status – **Complete** – NGDC has a lead developmental role in the development of virtual observatories for space physics. VIRBO leverages the considerable NGDC expertise in advanced archive & access tools and techniques.

Cognizant Person: Eric Kihn

Program: Space Weather



STP/SEG Milestone

Geomagnetic Database Tools



Milestone – Develop database management tools with SPIDR for the NGDC geomagnetic archive.

Background – Don Herzog (EGG) has proposed requirements for the “look and feel” and performance of the online geomagnetic archive. SEG is developing the tools and capabilities within SPIDR to address these requirements.

Completion Date - Planned: (Q3) 6/30/2007 Current: (Q3) 6/30/2007

Status – **Watch Item** – An initial set of upgrades provided to the SPIDR developers in April has been incorporated into the SPIDR Version 4 release. Don Herzog continues to provide guidance to the developmental team on improvements to the geomagnetic interfaces within SPIDR to facilitate the entry of station-level metadata and other geomagnetic information. The goal is to have each station owner responsible for maintaining their own metadata and related information. This is an ongoing developmental effort with a unknown completion date.

Cognizant Person: Eric Kihn (Don Herzog) Program: Space Weather



STP/SEG Milestone

SPIDR Version 4.0 Release



Milestone – Develop and release next upgrade (Version 4) of the Space Physics Interactive Data Resource (SPIDR).

Background – Version 4.0 has been deployed to Moscow and Grahamstown

Completion Date - Planned: (Q3) 6/30/2007 Current: (Q3) 5/31/2007

Status – Development and release are complete, its awaiting deployment to Boulder.

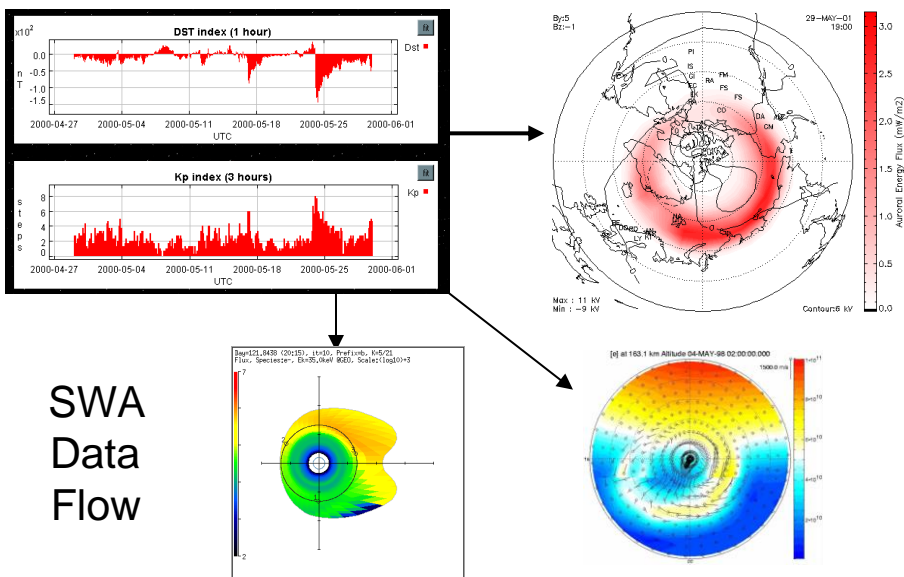
Cognizant Person: Eric Kihn

Program: Space Weather



STP/SEG Task

Space Weather Analysis



Purpose – The objective of this project is to generate a complete 16-yr space weather representation using physically consistent data-driven space weather models. The project will create a consistent, integrated, historical record of the near Earth space environment by coupling observational data from space environmental monitoring systems archived at NGDC with data-driven, physically based numerical models.

Upcoming Milestones

None.

➡ Milestone in the AOP

Team Members: Eric Kihn, Rob Redmon, Aaron Ridley & Trevor Garner

Status – AF/CCC has funded SEG to expand the time frame for the SWx climatology study. Recent progress has been made in developing a model dataset characterizing the geosynchronous energetic particle environment. Next steps are to validate the model output & prepare a paper for publication.

Space Weather program

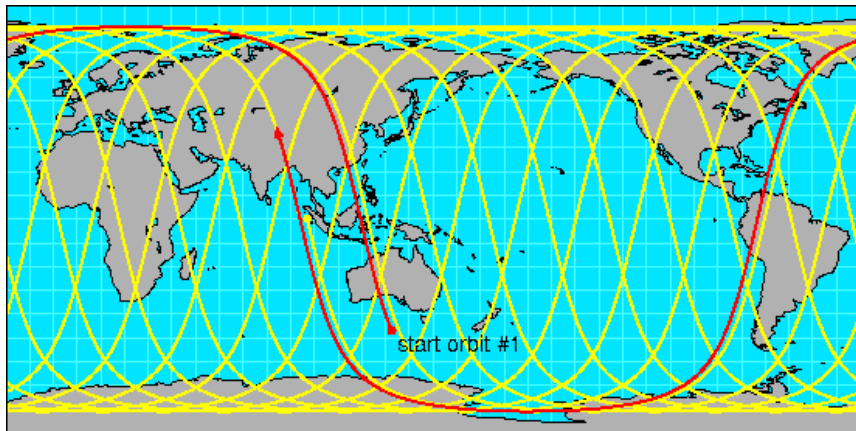


STP/SEG Task

Satellite SWx Data



POES daily orbits



Background – NGDC maintains a 30-yr historical database of satellite SWx data from DMSP, POES, GOES, and MetOp (new) data

Purpose – Satellite data are used to determine extremes in SWx conditions and monitor long-term variations in the space environment. These data are also used in specific case studies in coordination with other space data.

Upcoming Milestones

➡ **3QFY07** – Replicate operational GOES-13 Space Environment Monitor (SEM) relational database at NGDC. **[Done]**

➡ Milestone in the AOP

Team Members: Dan Wilkinson, Ed Erwin

Status: The GOES-13 relational database has been replicated within NGDC although SEC is now re-evaluating this data transfer mode. MetOp raw data ingest & archive continues. NESDIS is working an innovative commercial approach for acquiring solar-wind data with an option for an coronal mass ejection (CME) imager.

Space Weather program



STP/SEG Milestone (AOP)

GOES-13 Database Replication



Milestone – Replicate operational GOES-13 Space Environment Monitor (SEM) relational database at NGDC.



GOES-N Launch – May 2006

Background – Replication of the GOES-13 SEM database from SEC to NGDC was proposed as a means to serve real-time space weather data to interested parties. While the ideal solution is for both organizations to host the same database s/w package, concerns regarding IT security and the handling of high cadence data drove a solution that is workable but not ideal. This data transfer technique has not been fully tested in an operational environment.

Completion Date:

Planned: (Q4) 9/30/2007

Actual: (Q3) 6/30/2007

Significance – Real-time access to GOES SEM data is of value to commercial space weather service providers. Combining data archive ingest and real-time data distribution functions is an optimized approach for serving our users.

Cognizant Person: Dan Wilkinson



STP/SEG Task Solar Data Services



International Geophysical Calendar 2006 (FINAL)

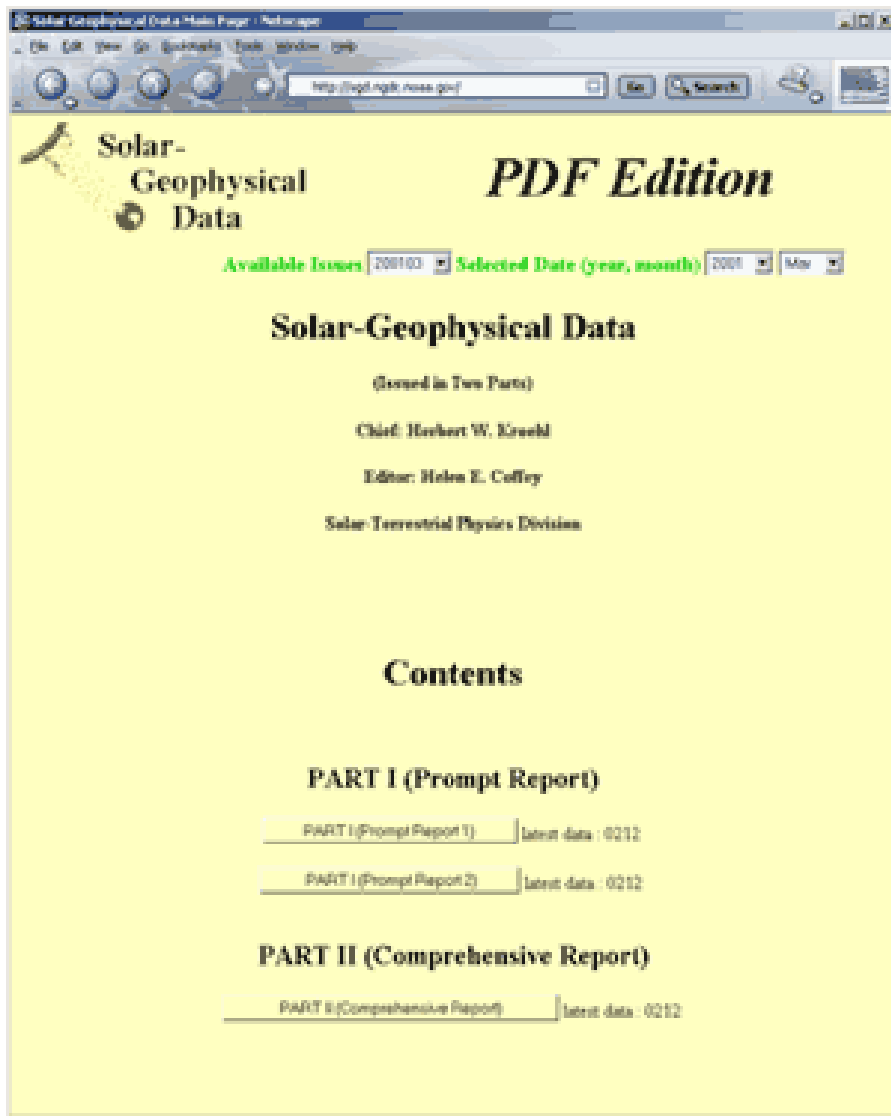
(See other side for information on use of this Calendar)

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FEBRUARY	29	30	31												22
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Info for the Director

Karen Now Assisting in Preparing the SGD



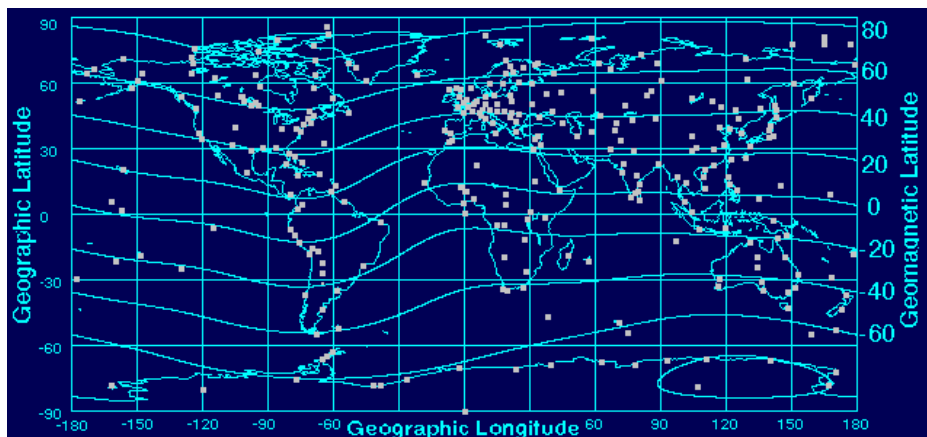


STP/SEG Task

Ionospheric Digital Database



Global Ionosonde Network



Upcoming Milestones

➡ **1QFY08** – Integrate Mirrion real-time ionospheric access system with SPIDR.

➡ Milestone in the AOP

Background – Ionograms are recorded tracings of reflected ionosonde radiowave. Reflected radiowaves provide critical information on the bottomside ionosphere up to the F₂ peak in electron density.

Purpose – Historical ionogram records are used to monitor ionospheric variability and extremes. Efforts are underway to make current measurements available in near real-time to support SWx operations.

Team Members: Rob Redmon, Terry Bullett, Ray Conkright, Justin Mabie

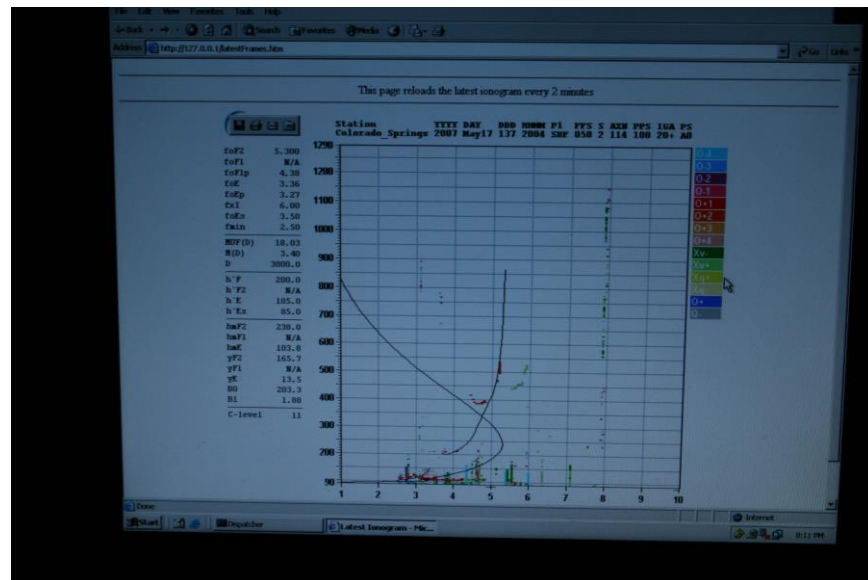
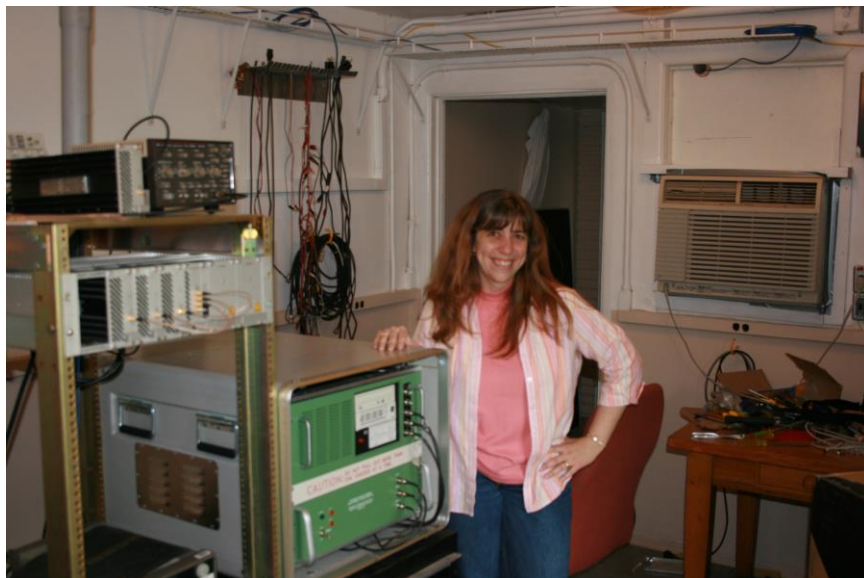
Status: Expert System for Ionogram Reduction (ESIR) is currently in operational testing. Additional data sources (Japan) are now being ingested into NGDC. Team is investigating possible International Heliophysical Year (IHY) support activities.

Space Weather program



Special Interest Item

CS839 – Ionosonde First Light



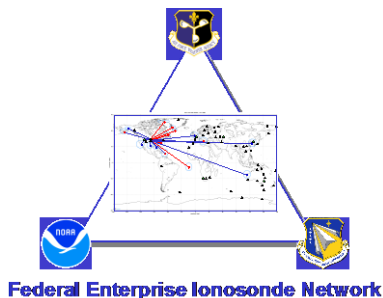
Background: The Air Force Academy (AFA) and NGDC are planning to deploy a new ionosonde on Guam. The first phase of the deployment was successfully completed with the testing of the transmit and receiver modules at the Boulder ionosonde site. The left photograph shows Professor Linda Krause standing next to the rack-mounted ionosonde electronics. The right image shows a standard ionosonde trace and derive ionospheric electron density profile.

Significance: The NWS Space Environment Center has a specified need for global ionospheric data. These ionosonde data contribute to ionospheric specifications and forecast used to assess space weather impacts on GPS navigation and high-frequency (HF) communications.





Info for the Director Ionosonde Deployments



Federal Enterprise Ionosonde Network (FEIN) - Col Mike Condray (AFWA/CC) discussed this during a recent visit to NGDC and requested that NGDC work with his staff on a strategic plan. A Support Agreement (SA) has been drafted & reviewed at the AO level. AFWA is currently awaiting Air Staff coordination on FEIN.



Ionosonde Re-location in Puerto Rico – An Inter-Agency Agreement (IA) for use of USGS facilities, including Puerto Rico, has been coordinated at the working level. USGS Legal has reviewed and is awaiting NOAA review. Ramey, PR sounder removal planned for late August.¹



Hosting the USAFA Ionosonde in Guam – NGDC & USAFA continue discussions regarding deployment to a Guam USGS site. An MOU with the USAFA has been drafted and coordinated at the working level. The MOU is waiting NOAA legal review.¹

¹Frequency Authorization for ionosonde operation has been approved



Accomplishments

Space Environment Group



- **2 publications in peer reviewed journals:**
 - ✓ E Kihn & R Redmon – Concurrency & Computation – *Integrating and mining distributed environmental archives on grids*
 - ✓ W Denig – Annales Geophysicae – *TRANS4: a new coupled electron.proton transport code – comparison to observations above Svalbard using ESR, DMSP and optical measurements*
- **NGDC contributes to solar cycle predictions**
 - ✓ Close-hold data issued during press release at SWW2007
- **CIRES/NGDC develops new SWx capability**
 - ✓ Herb Sauer & Dan Wilkinson – high-latitude radiowave absorption product
- **Mirrion posts 50% increase in real-time ionospheric data**
 - ✓ Serving the operational community for space weather data



Issues & Concerns

Space Environment Group



- **Terry Bullett recalled to AFRL**
 - Retaining Terry is key to the ionosonde program
 - Several “fall on your sword” options being played
- **Outstanding / Pending Vacancies**
 - non Real-Time Data Manager
 - Paperwork in process for CIRES Space Physicist
- **SPIDR support for geomagnetic data A&A**
 - Slow implementation of recommended changes
 - Need to make best use of D. Herzog while we have him
- **Deferred NGDC-SEC Summit**
 - Lack of progress in certain key areas
 - Reconsideration of GOES-13 database replication



Accomplishments

Space Environment Group



- **5 publications / conference proceedings / book chapters:**
 - ✓ E Kihn – Concurrency & Computation
 - ✓ W Denig – Annales Geophysicae
 - ✓ E Kihn - Computer Graphics and Geometry
 - ✓ E Kihn ACM GIS Conference Proceedings- Environmental Scenario Search and Visualization
 - ✓ E Kihn Wiley Book Chapter - Grid Data Mining with the Environmental Scenario Search Engine (ESSE)
- **NGDC contributes to solar cycle predictions**
 - ✓ Close-hold data issued during press release at SWW2007
- **Virtual Observatory Software released to Source Forge**
 - ✓ By request of the VOIG conference
 - ✓ <http://sourceforge.net/projects/vxoware>



Accomplishments cont.

Space Environment Group



Presentation of CLASS API to DMIT

- ✓ Requested by Ken McDonald and Rick V.

Presentations

- ✓ J Mabie, T Garner, Kihn E A, R Redmon, Analysis of Simple Inner Magnetosphere Model, SWW 2007
- ✓ R Redmon, J Manley, T Bullett, J Mabie, "NGDC Ionosonde Program", SWW 2007
- ✓ D Anderson, M Fedrizzi, R Caton, R Redmon, C Coker, P Straus, "Relating UHF S4 Index Values w/ExB Drift Velocities Under Solar Cycle Minimum Conditions"
- ✓ Acknowledgements to R Redmon, J Mabie, T Bullett, R Conkright: "Statistical Study of Mid Latitude Spread F at Wallops Island, Virginia", CEDAR 2007
- ✓ E A Kihn [Scientific Data Stewardship and the VO's](#), VOIG 2007
- ✓ E. A. Kihn [The Global Earth Observation Integrated Data Environment \(GEO-IDE\) as a virtual observatory](#) , VOIG 2007

Professional Requests

- ✓ Iono group: Identify a mid latitude station for a future spread F study. Research supports Greg Earle rocket program.
- ✓ Redmon: Provide November 2004 Super Storm analysis as relates to ISR and ionosonde measurements for 2007 Fall AGU special session.



Issues & Concerns

Space Environment Group



- **Boulder-StarLight-Moscow** – slow progress and apparently out of our control.
- **CLASS TET** – very time consuming but of great interest to NGDC.



OUTLINE

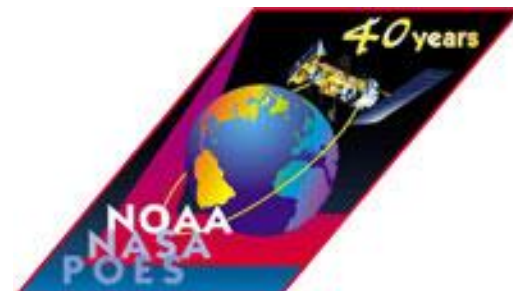
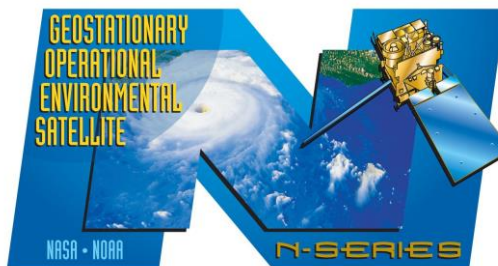


STP Program Management Review

- **STP Overview/Status**
- **Earth Observation Group**
- **Earth Geophysics Group**
- **Space Environment Group**
- ➔ • **Deep Dive – Satellite Data**
- **Concluding Remarks**

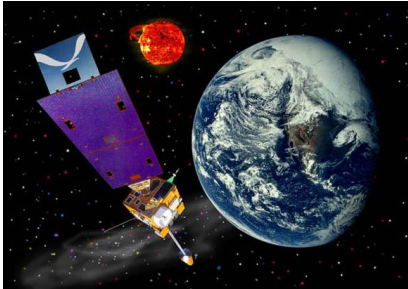


Deep Dive Satellite Data Services



The Satellite Data Services team acquires, archives, & disseminates space environmental data from DOC and DoD weather satellite systems

Geostationary Operational Environmental Satellites (GOES)



Spacecraft

- Altitude: 35,800 km ($6.7 R_e$)
- Orbit: Geostationary (GOES-E & GOES-W)
- Program Lifetime: 1974 to *tbd*

Space Environmental Sensors (current instrument suite)

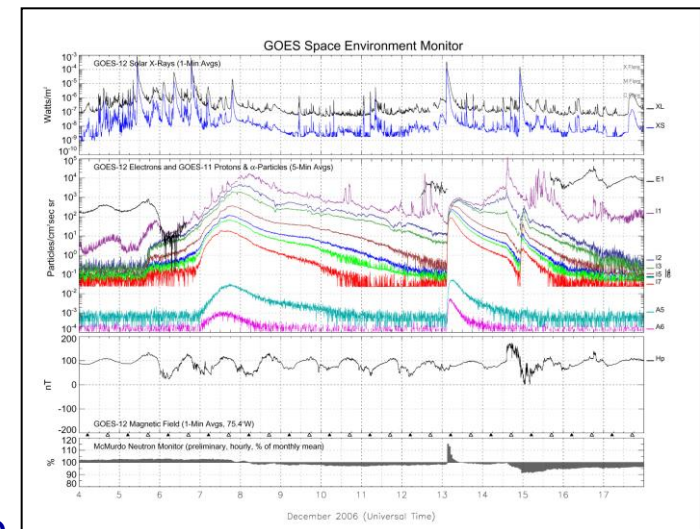
- Space Environmental Monitor (SEM)
 - Energetic Particle Sensor (EPS)
 - Magnetometer
 - Solar x-ray sensor (XRS)
- Solar X-ray Imager (SXI)

NGDC SWx Archives (1974 – present)

- Distribution: Process products via SPIDR & http
- Archived data: 3.5 TB total, 2 GB/day processed

Issues

- *Backlog availability for full resolution data from SEC*
- *Full database replication for GOES-13 not implemented*



Polar Operational Environmental Satellite (POES)



Spacecraft

- Altitude: 840 km
- Orbit: Sun-synchronous, polar
- Program Lifetime: 1962 to >2010

Space Environmental Sensors (current instrument suite)

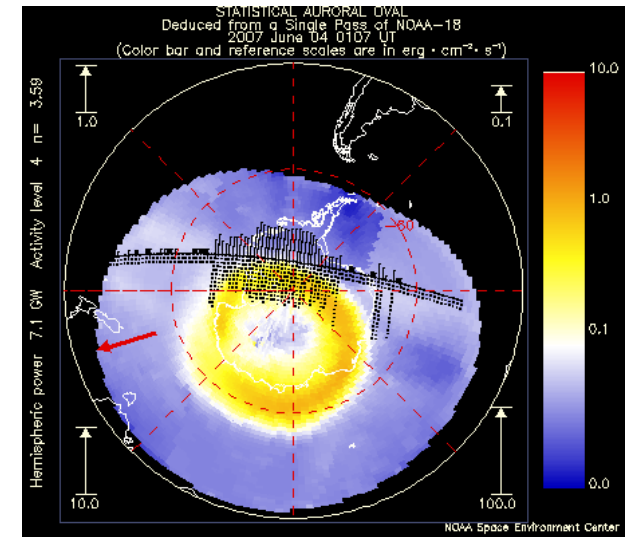
- Space Environmental Monitor (SEM) – included on TIROS-N (1978) and beyond
 - Medium Energy Proton & Electron Detector (MEPED)
 - Total Energy Detector (TED)

NGDC SWx Archives (1978 – present)

- Distribution: via http
- Archived data: 96 GB total, .26 GB/day processed

Issues

- SEC to provide level-1b daily raw data



Polar Operational Environmental Satellite (POES)



Spacecraft

- Altitude: 840 km
- Orbit: Sun-synchronous, polar (LTAN: 0930)
- Program Lifetime: 2007 – *tbd*

Space Environmental Sensors (2006 – present)

- Space Environmental Monitor (SEM), included on MetOp A & B, only
 - Medium Energy Proton & Electron Detector (MEPED)
 - Total Energy Detector (TED)

NGDC SWx Archives – tbd¹

- Distribution: n/a¹
- Archived data: n/a¹

Issues

- *Submission agreement with SEC in coordination*
- *No SEM on MetOp-C – potential data gap*

¹Awaiting submission agreement with SEC





Satellite Data Services

DMSP



Defense Meteorological Satellite Program (DMSP)



Spacecraft

- Altitude: 840 km
- Orbit: Sun-synchronous, polar (LTAN: 0930 & 1730)
- Program Lifetime: *tbd* – 2016

Space Environmental Sensors (current instrument suite)

- Special Sensor Electron & Ion Spectrometer (SSJ)
- Special Sensor Topside Plasma Monitor (SSIES)
- Special Sensor Magnetometer (SSM)
- Special Sensor Ultraviolet Spectrographic Imager (SSUSI)
- Special Sensor Ultraviolet Limb Imager (SSULI)

NGDC Satellite SWx Archives – 1992 – present

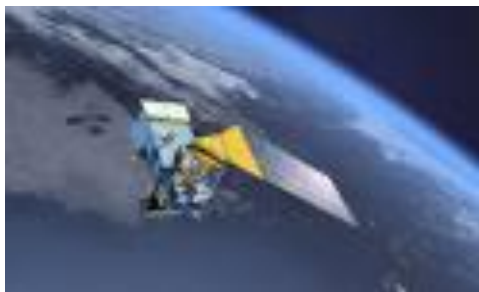
- Distribution: Browse imagery available via SPIDR
- Archived data: 4.2 TB total processed, 1.1 GB/day processed

Issues

- *NGDC has no capability to process SWx data from current DMSP satellites*
- *Roles & responsibilities for CLASS/NGDC unresolved*



National Polar-orbiting Operational Environmental Satellite System (NPOESS)



Spacecraft

- Altitude: 840 km
- Orbit: Sun-synchronous, polar (LTAN: 1330 & 1730)
- Program Lifetime: 2014 – 2024

Space Environmental Sensors (post Nunn-McCurdy architecture)

- Space Environmental Monitor (SEM-2), manifested for C1 & C3 only
 - Total Energy Detector (TED)
 - Medium Energy Proton & Electron Detector (MEPED)

NGDC Satellite Space Weather Archives

- Distribution: n/a
- Archived data: n/a

Issues

- *Archive responsibilities vis-à-vis CLASS still undefined*





OUTLINE



STP Program Management Review

- **STP Overview/Status**
- **Earth Observation Group**
- **Earth Geophysics Group**
- **Deep Dive – Satellite Data**
- **Space Environment Group**
- ➔ • **Concluding Remarks**



Concluding Remarks

STP Program Management Review



METRICS (FY07 to date)

- Peer Review Publications: 6
- Conference Proceeding/Reports: 4
- Presentations: 20 (*tbd*)
- Milestones: 8 completed (4 this qtr); 1 watch Item

ISSUES

- Federal Enterprise Ionosonde Network (FEIN)
- Personnel – 2 actions in process; 3 pending
- STP Budget Analyst – Limited front-office personnel